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ABSTRACT

An experiment was designed to demonstrate that infants as young as 3 months of age would show face/voice coordination in matched and mismatched conditions if exposure trials were extended to 1 minute in duration. A total of 16 infants participated in each of four experimental conditions. Conditions were (1) mother present with mother's voice broadcast; (2) stranger present with stranger's voice broadcast; (3) mother present with stranger's voice broadcast; and (4) stranger present with mother's voice broadcast. In all conditions, the "speaker" moved her lips in synchrony with the taped message but did not speak aloud. Each condition was tested twice, and the eight trials were counterbalanced. Data were reduced from videotapes by two independent judges. Attention, vocalization, and subjective measures were analyzed by a repeated measures analysis of variance. Findings showed that, overall, infants appeared significantly more upset during mismatched conditions and significantly more happy during matched conditions. In contrast to previous findings, it was concluded that, given an adequate length of exposure, infants younger than 8 months of age will react with differential attention and distress to mother/stranger face/voice mismatches. (RH)

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Auditory-visual coordination in 3 month olds: voice-face mismatch

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A common method for testing auditory-visual integration involves separating the visual-auditory attributes of an object and presenting them in matched or mismatched conditions. Cohen (1974), using the face and voice of mother and female stranger, had a matched condition in which mother's voice issued from mother's face and stranger's voice issued from stranger's face, and a mismatched condition in which mother's face was paired with stranger's voice and vice versa. He found that no 5 month olds and few 8 month olds were distressed by face-voice mismatches. Cohen concludes that even at 8 months of age perceptual cognitive competency has not developed sufficiently to substantially integrate auditory and visual associations. Cohen's results and conclusions are surprising in view of Lyons-Ruth (1977) finding that 4 month olds can appreciate visual-auditory relationships in inanimate objects and reports that babies are more advanced in developing concepts of persons than of inanimate objects (e.g., Bell, 1970).

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Since the capabilities tested in Cohen's and Lyons-Ruth's studies were highly similar, the difference between the two sets of results might be due to a difference in methodology, specifically, the length of exposure trials. Cohen's trials varied from 17 to 22 seconds whereas Lyons-Ruth's were at least 60 seconds long. Since young infants need more time to react

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to sensory stimuli than older children (White, 1963), the length of exposure to matched and mismatched conditions may have been the critical factor.

Pilot work in our laboratory with babies of various ages seemed to show that infants as young as three months of age would show face-voice coordination in matched/mismatched conditions if the length of exposure trials were extended to 1 minute. The following experiment was designed to demonstrate this.

Method

Subjects

Sixteen 3 month old infants (8 males and 8 females) were studied in each of the experimental conditions. The mean age of the group was thirteen weeks and all were full term and healthy. Infants were recruited through form letters mailed to parents who were listed in the local newspaper's birth notices. Parents were paid $5.00 for their infant's participation.

Procedure and Apparatus

Each infant was exposed to one of two auditory tapes in each experimental condition. One tape, the stranger's, was common to all infants. The other, the mother's, was different for each infant. Each tape repeated the following message for 1 minute:

> Hi there! Are you having fun? Do you like this room? What do you think of all this? Is it fun?

Questions were emphasized in the message so as to maximize affect in the mother's voice. Mothers were allowed to practice before a final tape was made.

The four experimental conditions were: mother speaking with mother's voice (M/MV), stranger speaking with stranger's voice (S/SV), mother speaking with stranger's voice (M/SV), and stranger speaking with mother's voice (S/MV). Each condition was tested twice and the eight trials counterbalanced so that no condition was repeated consecutively and each condition occurred once in every position in the trial order. During the trials both mother and stranger were instructed to lean forward and to look at the infant. In all conditions the "speaker" moved her lips in synchrony with the taped message, but did not speak aloud. Thus infants only heard the taped message at all times.

During each condition the mother and stranger sat in front and slightly to either side of the infant (distance from infant's face to that of mother and stranger was 30 cm.; the distance from mother to stranger was 60 cm.). The infant, seated in an infant seat, was able to fixate both mother and stranger without moving the head. The taped message emanated from a speaker worn around the collar of either the mother or stranger. The distance from mouth to speaker was 7 cm. All experimental sessions were recorded on videotape.

The data was reduced from the videotapes by two independent judges. The principle attention measures used were length of first fixation, average length of time of any one fixation to a stimulus figure, and amount of time spent with eyes closed and looking away from the stimulus figures. The principle vocalization measures were amount of crying/fretting and first occurrance of crying/fretting. Subjective measures of upset and happy

as indicated by facial expression were also analyzed. All data presented were analyzed by a repeated measures ANOVA with one grouping factor, sex, and one within factor, condition where the two levels of condition were matched and mismatched.

Infants' first fixation to the stimulus figures were significantly shorter for mismatched than matched conditions. The average length of any one fixation to a stimulus figure was also found to be significantly shorter for mismatched than matched conditions. Several other attention measures approached significance. Infants tended to look away more of the time during mismatched than matched conditions with females doing so more than males. Females also closed their eyes significantly more often and longer than males, while males looked back and forth between stimulus figures significantly more than females in the mismatched conditions.

As previously described, two aspects of crying/fretting were analyzed, amount and first occurrance. Infants cried/fretted more to the mismatched than matched conditions. Males tended to cry/fret more than females. Eleven of the sixteen infants tested cried/fretted at some point during the experimental trials. Of these, ten first cried/fretted during a mismatched condition, which was more than would be expected by chance. None of the eight infants who were exposed to a matched condition on the first trial cried/fretted during that trial. Of the eight infants whose first trial was a mismatched condition, four cried/fretted during that trial. This difference in response was significant.

In order to compare the results of the present study with

those of Cohen's 1974 study, latency to cry/fret was noted for the eleven infants who demonstrated this behavior. For the trial in which crying/fretting first occurred, latency to cry/fret was greater than 17 seconds (the length of Cohen's trials), for nine of the eleven infants.

Overall, infants, as determined by their facial expression, were judged to appear upset significantly more during mismatched than matched conditions while appearing significantly more happy during matched than mismatched conditions.

Discussion

The present study finds that three month old infants readily discriminate matched from mismatched conditions. Since infants tended to experience more upset during mismatched than matched conditions, and first became upset during a mismatched condition significantly more often than during a matched condition, it seems reasonable to conclude that an association between mother's face and voice had been formed previous to the experimental test, and breaking this association in the mismatched condition was responsible for the observed distress. The fact that out of the eleven infants who cried/fretted during the experimental conditions, nine did so only after seventeen seconds confirms the basic hypothesis of this study, that in order for infants to react with distress to face/voice mismatch, exposure trials of longer than 17 seconds must be used. This finding is congruent with that reported by Rose and her colleagues in 1981 for visual and tactual sensory integration, who found that increasing the length of exposure to visual and tactual stimuli increased the

likelihood that young infants would give responses indicating cross-modal recognition.

In summary, we conclude that infants younger than the 8 months of age reported in the literature will react with differential attention and distress to mother/stranger, face/voice mismatches given an adequate length of exposure.